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Stag beetles of the genus *Dorcus* MacLeay in North America (Coleoptera, Lucanidae)

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Abstract

General confusion has surrounded the status of Nearctic *Dorcus* species since the 19th Century. In this paper the two Nearctic species are clarified and compared, and morphological characters discussed that will readily distinguish them. Examination of the type specimens of *D. mexicanus* reveals that they are actually mislabeled specimens and that the species is a new synonym of the Palearctic *D. parallelipipedus* (L.).

Keywords

Systematics, Lucanidae, Nearctic, *Dorcus brevis*, *Dorcus parallelus*, *Dorcus mexicanus*, synonym

Introduction

The status of the North American species of *Dorcus* MacLeay has been the subject of debate since the late 1800s. On more than one occasion I have been asked how many species are present in our fauna, and so the purpose of this paper is to discuss the morphology of the North American species and provide the relevant characters for identification. Factors that have complicated the taxonomy are the relatively small numbers of known specimens of *D. brevis*, the markedly different morphology of large and small specimens due to allometric growth, and the general trend in *Dorcus* species for larger individuals to be less punctate.

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Say described both *Lucanus parallelus* (1823) and *L. brevis* (1825). The former was subsequently transferred to *Dorcus* by Burmeister (1847), and the name *L. oblongus* de Charpentier, 1825 (based on a pair mislabeled as coming from the Pyrenees) was treated as a synonym. The description of new species based on mislabeled specimens is a frequent occurrence in Lucanidae, especially in *Dorcus*; *D. caucasicus* Ganglbauer, 1886 (mislabeled as coming from the Caucasus Mountains) was reduced to a synonym of *D. brevis* by Reitter (1892). Angell (1916) described the form *D. carnochani,* a synonym of *D. parallelus.*

A history of the ensuing debate over the distinctness of *D. brevis* and *D. parallelus* was provided in Benesh (1937). These species were frequently declared to be identical or merely forms of the same species (Parry 1870; Fuchs 1882; Horn 1892; Wickham 1899). Skinner (1911) planted the first seeds of doubt concerning the synonymy but stopped short of arguing for the 'specific value' of *D. brevis.*

Benesh (1937) distinguished the two species by the form of their posterior angles of the pronotum and overall body shape. His concepts of both species appear to be more or less correct based on specimens illustrated. However, his illustration of the male genitalia of *neither* species matches the actual morphology, which could indicate that the genitalia studied were broken during dissection or improperly relaxed. If male specimens with short flagella were identified by Benesh as *D. parallelus*, the locality information given in that paper and in Benesh (1942) may be suspect. Also, his characterization of the female mandibles as unidentate in *D. brevis* and bidentate in *D. parallelus* does not appear to be correct because no obvious difference in the dentition of female mandibles occurs in these species. However, based on the specimens examined it appears that *D. brevis* is widely distributed in the eastern United States.

Benesh (1944) described a third North American species, *Dorcus mexicanus,* from a male and female specimen in the Field Museum (FMNH) collection, the male with the locality as Jalapa, Mexico. Reyes-Castillo and Boucher (2003) noted that the distribution of the species in Mexico was unknown. Other than the type series, no other specimens of this species have been reported. Only one element of the Nearctic lucanid fauna, *Lucanus mazama* (LeConte), is known to extend into northern Mexico (Paulsen 2005). In a biogeographical sense, it seems unlikely that a species in the Holarctic genus *Dorcus* would be endemic to Neotropical Mexico. For this reason, I examined and compared the type specimens of *D. mexicanus* with the known species in the genus.

Results

Dorcus brevis and *D. parallelus*

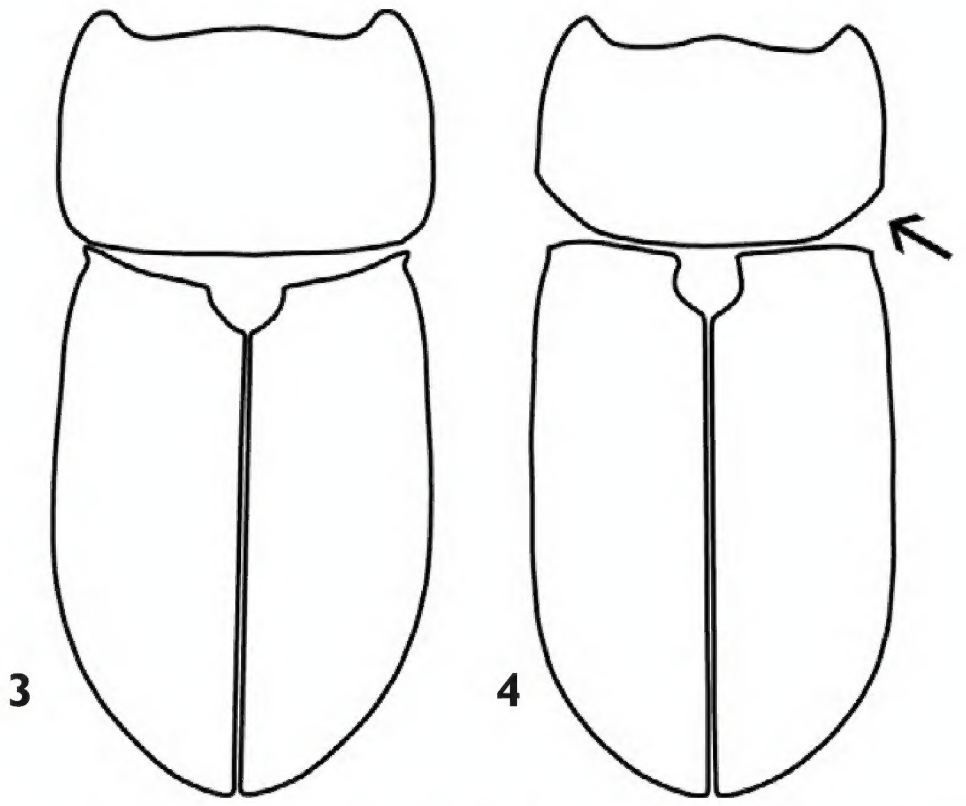
The overall broader form of the body of *D. brevis* (Fig. 1) is often adequate to distinguish it from the relatively narrower *D. parallelus* (Fig. 2). However, the most useful and obvious external character for separating the North American species is the shape of the posterior pronotal angle. In *D. brevis,* the posterior angles are in close proximity to the elytral bases

Figures 1–2. Dorsal habitus of major males. **1** *Dorcus brevis* (length 30mm) **2** *Dorcus parallelus* (length 26mm). Scale bar = 5mm.

(Fig. 3). In *D. parallelus*, the angles are distinctly removed from the base of the elytra (Fig. 4). The humeral angles of *D. brevis* are generally more strongly dentate and the humeri produced forward of the scutellum, while in *D. parallelus* the humerus is less strongly dentate and more or less in line with the scutellum. In addition, males of *D. parallelus* have a dense field of setae on the internal face of the metatibia (Fig. 5), but this patch is not present on males of *D. brevis* (Fig. 6). The clypeus is distinctly broader in males of *D. parallelus.*

In both species, the mandibles of major males have a single large dorsal tooth, but the dentition of the mandibles of minor males is clearly distinct. Even the smallest minor males of *D. parallelus* have mandibles that are of the same basic shape as major males, but they are simply reduced in size (Fig. 7). In contrast, minor males of *D. brevis* have two distinct internal teeth below the dorsal tooth and are abruptly curved internally (Fig. 8).

The form of the male genitalia is radically different in the two species. The flagellum of *D. parallelus* is longer than the entire length of the body and is weakly flared at the apex (Fig. 9). The flagellum of *D. brevis* is less than half as long, with a large lobe-like sac at the apex (Fig. 10). The genitalia of the European species, *D. parallelipipedus,* differs from either species in being more strongly expanded medially and in possessing a trilobed apex (Fig. 11).



Figures 3–4. Outline of body shape in females. **3** *Dorcus brevis* **4** *Dorcus parallelus*, arrow pointing to posterior pronotal angle distinctly removed from the base of the elytra.

Dorcus mexicanus

Examination of the type specimens of *D. mexicanus* revealed that they are *Dorcus parallelipipedus* (L.), a Palearctic species. The identical male genitalia (Fig. 11), protruding clypeus of males, irregularly punctate elytra, and bituberculate frons of the female provide overwhelming evidence to support this conclusion. Thus, the name *D. mexicanus* Benesh is here reduced to a synonym of *D. parallelipipedus* (new synonymy).

Coincidentally, I encountered a second pair of *D. parallelipipedus* recently accessioned at the FMNH that bore handwritten labels indicating "Mexico, Nuevo Leon, Monterey (sic), Aug 1976". The presence of a second, more recent pair of *D. parallelipipedus* from Mexico at first suggested that the species might be introduced there. However, on further examination I found that other handwritten locality labels of the same style from the accessioned collection were erroneous (with incorrect countries). While it is not impossible that the species is adventive in Mexico, it is more likely given the nomenclatural history of *Dorcus* that the common *D. parallelipipedus* has been mislabeled in these two instances.

Dorcus brevis (Say, 1825)

Lucanus brevis Say 1825: 202, original combination. Type material: Not listed among the existing Say type material by Mawdsley (1993).

Dorcus caucasicus Ganglbauer 1886: 81, synonym (Reitter 1892). Type material (NMW- Vienna), not examined.

Figures 5–6. Left metatibia of males, ventral view. **5** *Dorcus parallelus,* arrow pointing to dense field of setae **6** *Dorcus brevis.*

Distribution. Specimens examined from Florida, Georgia, Illinois, Missouri, New Jersey, South Carolina, Tennessee, and Virginia. In addition to these states, Benesh (1937) listed Alabama, Indiana, Mississippi, North Carolina, and Oklahoma, while Benesh (1944) added Kansas, Maryland, and Michigan.

Dorcus parallelus (Say, 1823)

Lucanus parallelus Say 1823: 248, original combination. Type material: Not listed among the existing Say type material by Mawdsley (1993).

Lucanus oblongus Charpentier 1825: 214, synonym (Burmeister 1847). Type not examined.

Dorcus costatus LeConte 1866: 35, synonym. Type material: Holotype female (MCZ) labeled a) red disk; b) handwritten "var. *costatus* / LeC."; c) reddish-orange label "Type / [3688]".

Dorcus parallelus nanus Casey 1909: 278, synonym. Type material: Syntype male (USNM) labeled a) "CASEY / bequest / 1925"; b) reddish-orange label "TYPE USNM / [36202]". Syntype female (UNSM) labeled a) as male; b) reddish-orange label "[*nanus – 2*] / PARATYPE USNM / [36202]".

Figures 7–8. Head of minor males, dorsal view. Inset showing dentition of right mandible. **7** *Dorcus parallelus* **8** *Dorcus brevis*.

Dorcus carnochani Angell 1916: 70, synonym. Type material: Two syntype males and one syntype female, possibly located in storage at the Brooklyn Museum, not examined.

Distribution. Specimens examined from Alabama, Illinois, Indiana, Iowa, Maryland, Michigan, Nebraska, New York, Ohio, South Carolina, Tennessee, and Virginia.

Dorcus parallelipipedus (Linnaeus, 1758)

Scarabaeus parallelipipedus Linnaeus 1758: 354, original combination. Palearctic synonymy given in Bartolozzi and Sprecher-Uebersax (2006).

Dorcus mexicanus Benesh 1944: 45, syn. n. Type material: Holotype male (FMNH) labeled a) "JALAPA / MEX"; b) male symbol; c) "FIELD MUSEUM / (F. Psota

Figures 9–11. Male genitalia (parameres and flagellum). **9** *Dorcus parallelus* **10** *Dorcus brevis* **11** *Dorcus parallelipipedus.* Scale bar = 5 mm.

Coll.)"; d) reddish-orange paper "Holotype / male symbol CNHM / [*Dorcus / mexicanus* / Benesh]"; e) handwritten "*Dorcus / mexicanus* / MS Benesh", on reverse "Det. Dec. 15, 1943 / B. Benesh". Female allotype labeled a) female symbol; b) as c of holotype; c) on reddish-orange paper "Allotype / CNHM female symbol / [*Dorcus / mexicanus* / Benesh]".

This species is distributed in Europe, Asia, and Northern Africa (Bartolozzi & Sprecher-Uebersax 2006).

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References

Angell JW (1916) Two new lucanids from North America. Bulletin of the Brooklyn Entomological Society 11: 70.

Bartolozzi L, Sprecher-Uebersax E (2006) Lucanidae. In: Löbl I, Smetana A. (Eds), Catalogue of Palaearctic Coleoptera. Vol. 3. Scarabaeoidea – Scirtoidea – Dascilloidea- Buprestoidea – Byrrhoidea. Apollo Books, Stenstrup, Denmark. 63–77.

Benesh B (1932) Notes on some stag-beetles (Coleop.: Lucanidae). Entomological News 43: 40–41.

Benesh B (1937) Some notes on boreal American Dorcinae (Coleoptera: Lucanidae). Transactions of the American Entomological Society 63: 1–15.

Benesh B (1942) Some notes on Nearctic stagbeetles, with description of a new species of *Platycerus* from Pacific Northwest (Coleoptera: Lucanidae). Entomological News 53: 221–223.

Benesh B (1944) A new *Dorcus* from Mexico (Coleop.: Lucanidae). Entomological News 55: 45–47.

Benesh B (1960) Coleopterorum Catalogus Supplementa, Pars 8: Lucanidea (sic). W. Junk, Berlin. 178 pp.

Burmeister HCC (1847) Lucanidae (pp. 304–530). In: Handbuch der Entomologie. 5 (Coleoptera Lamellicornia, Xylophila et Pectinicornia). TCF Enslin, Berlin, Germany. VIII + 584 pp.

Charpentier T de (1825) Horae entomologicae, adjectis tabulis novem coloratis. AA Gosohorsky, Wroclaw, Poland. 255 pp.

Fuchs C (1882) Synopsis of the Lucanidae of the U.S. Bulletin of the Brooklyn Entomological Society 5: 49–60.

Horn GH (1892) *Dorcus parallelus* Say. Entomological News 3: 73–74.

Mawdsley JR (1993) The entomological collection of Thomas Say. Psyche 100: 163–171.

Reitter E (1892) Bestimmungs-Tabelle der Lucaniden und coprophagen Lamellicornen des palaearctischen Faunengebietes. Verhandlungen des Naturforschenden Vereines in Brünn, 30: 140–262.

Reyes-Castillo P, Boucher S (2003) Familia Lucanidae. Pp. 167–172. In: Morón MA (Ed), Atlas de los escarabajos de México. Coleoptera: Lamellicornia. Vol. II. Argania Editio, Barcelona, Spain. 227 pp.

Skinner H (1911) Two rare species of Coleoptera. Entomological News 22: 354–357.

Wickham HF (1899) The Coleoptera of Canada. XXX. The Lucanidae of Ontario and Quebec. Canadian Entomologist 31: 21–25.